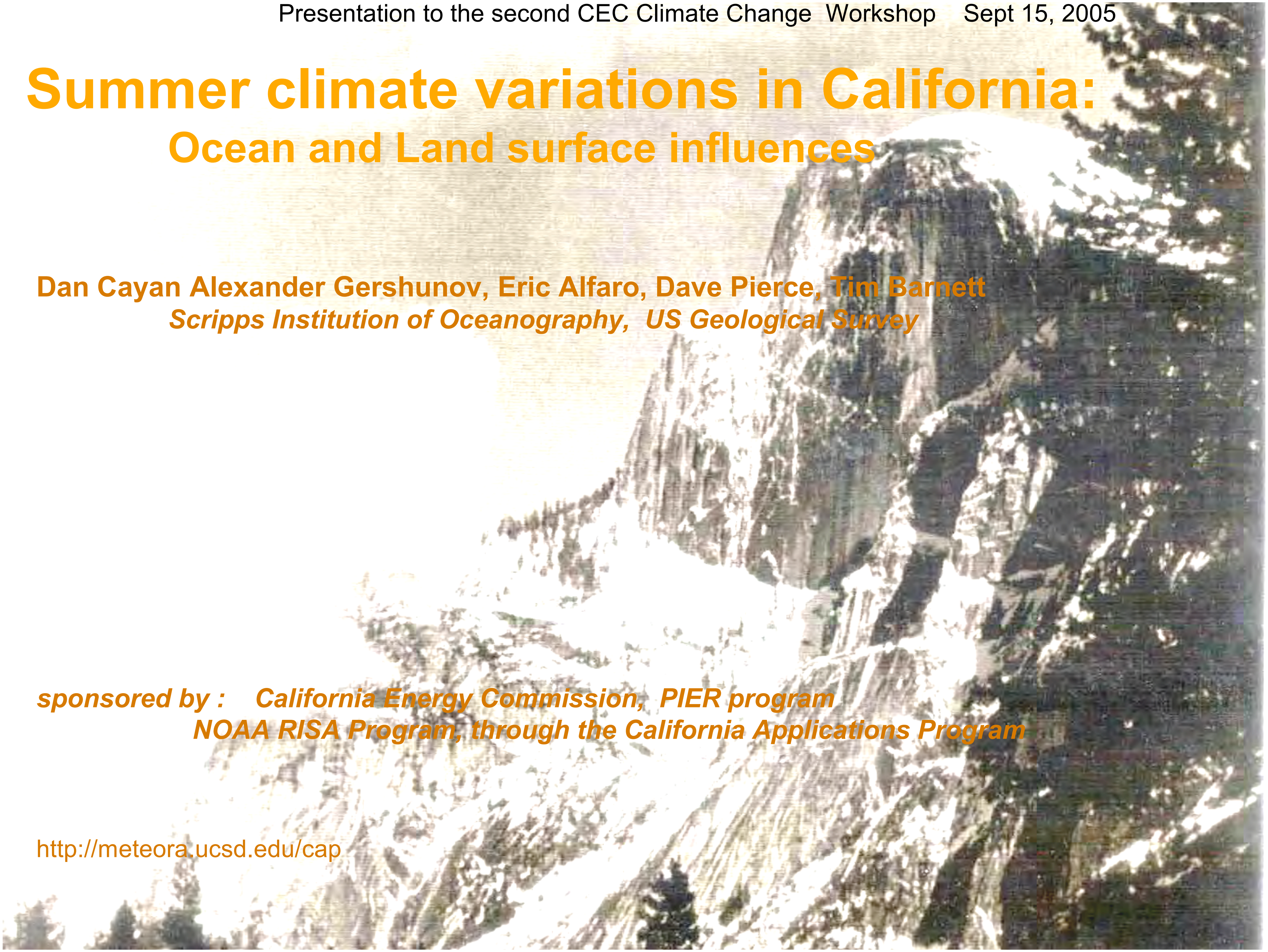

Presentation to the second CEC Climate Change Workshop Sept 15, 2005

Summer climate variations in California:

Ocean and Land surface influences

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Scripps Institution of Oceanography, US Geological Survey

sponsored by : California Energy Commission, PIER program

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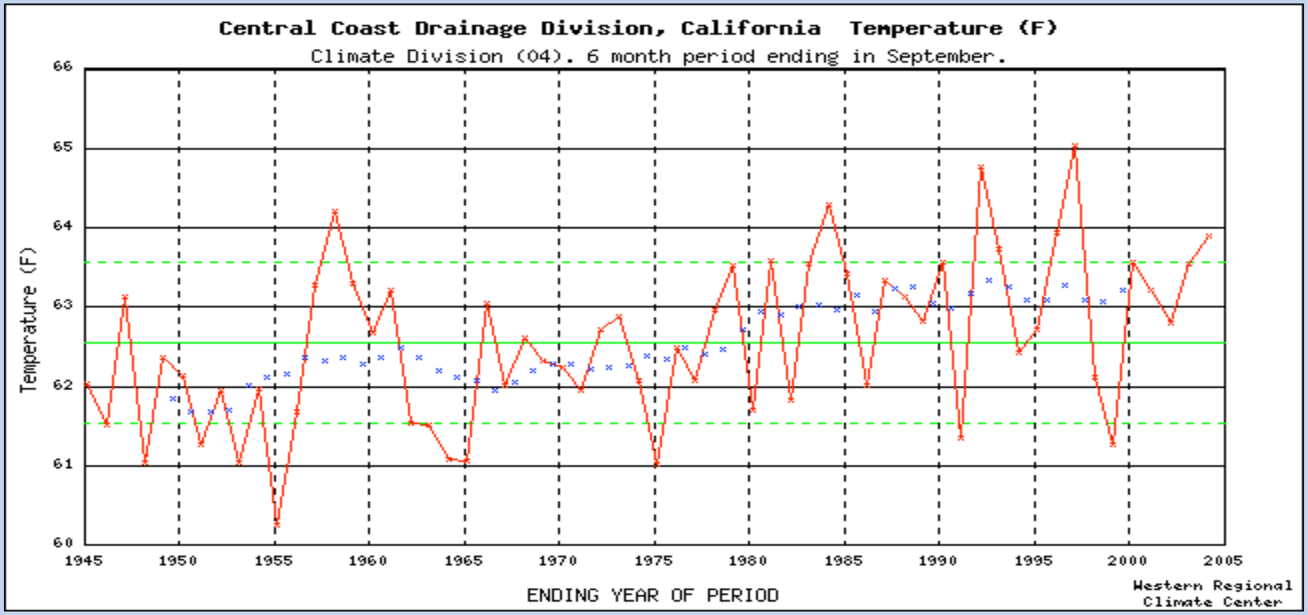
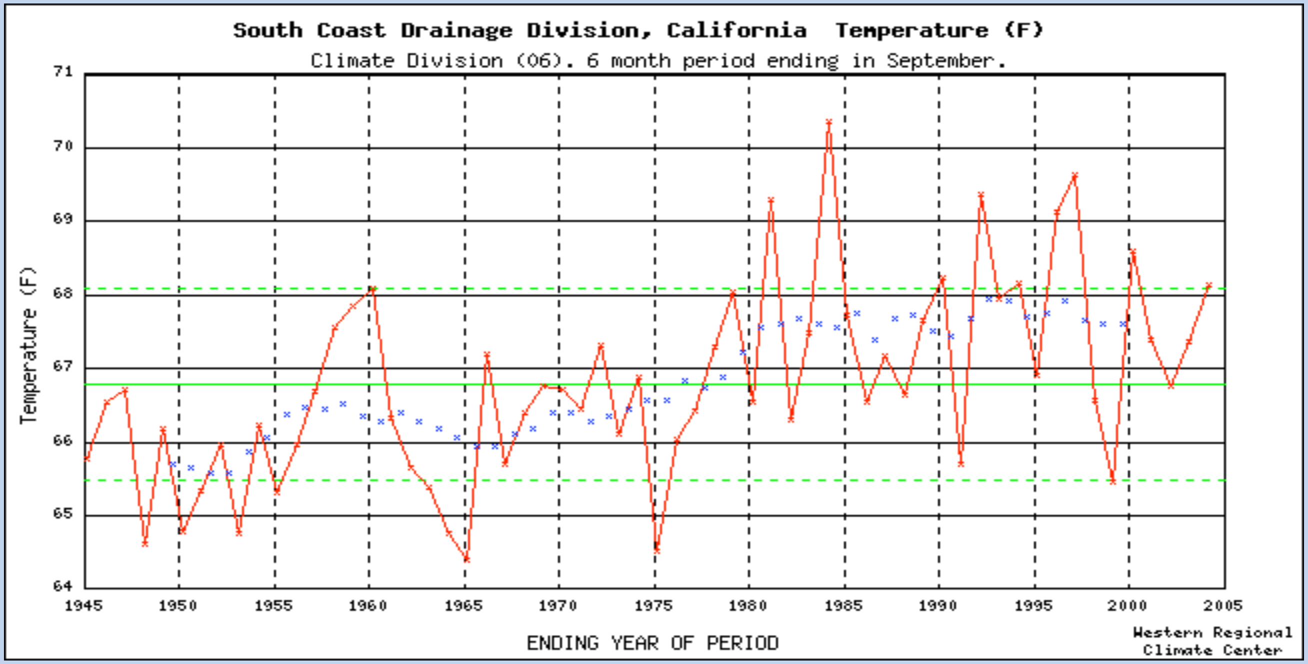
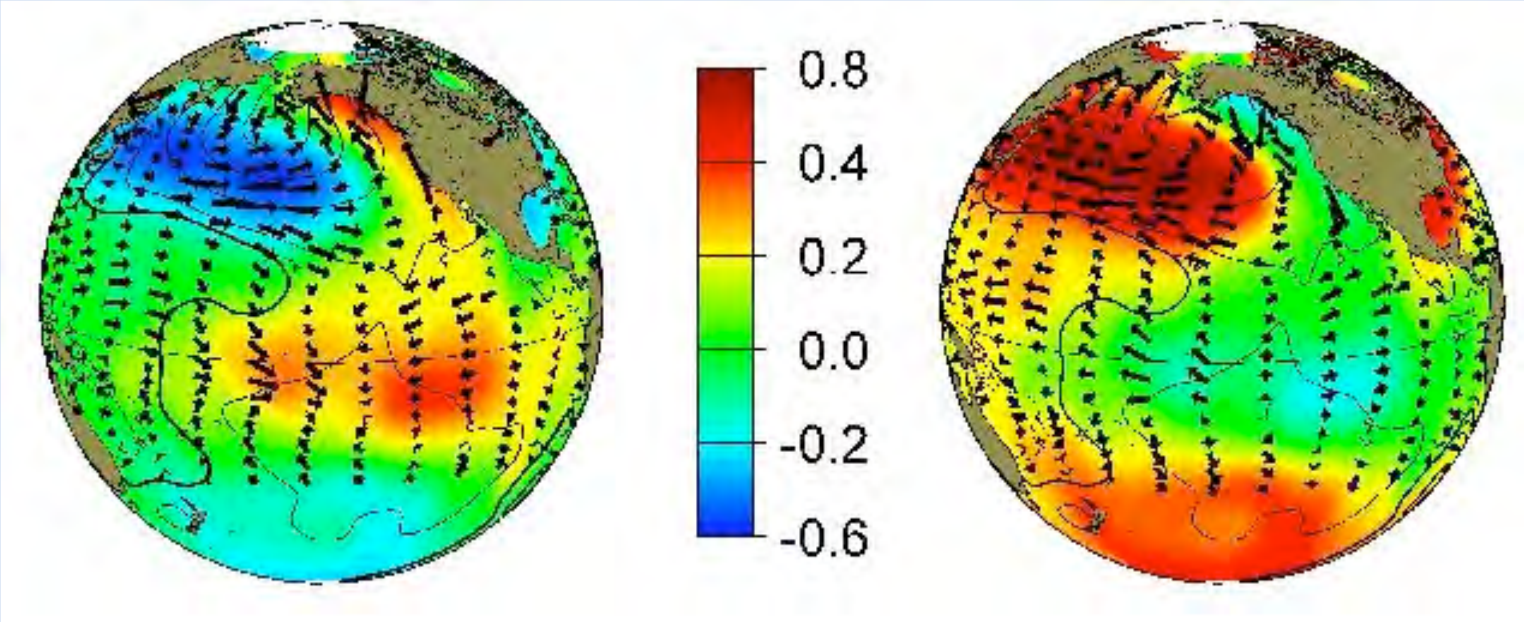
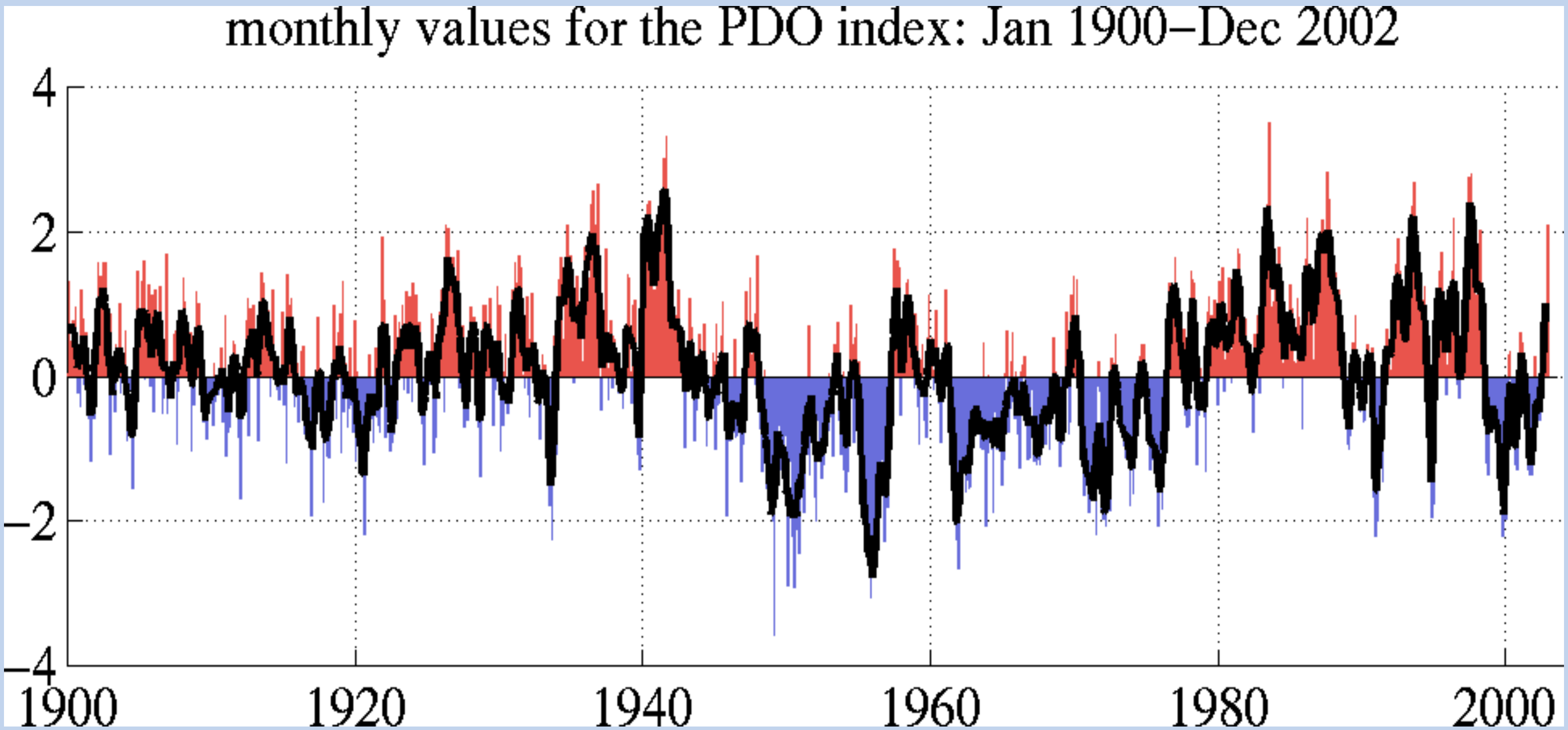


Even summer Temperatures have shown low frequency Variation



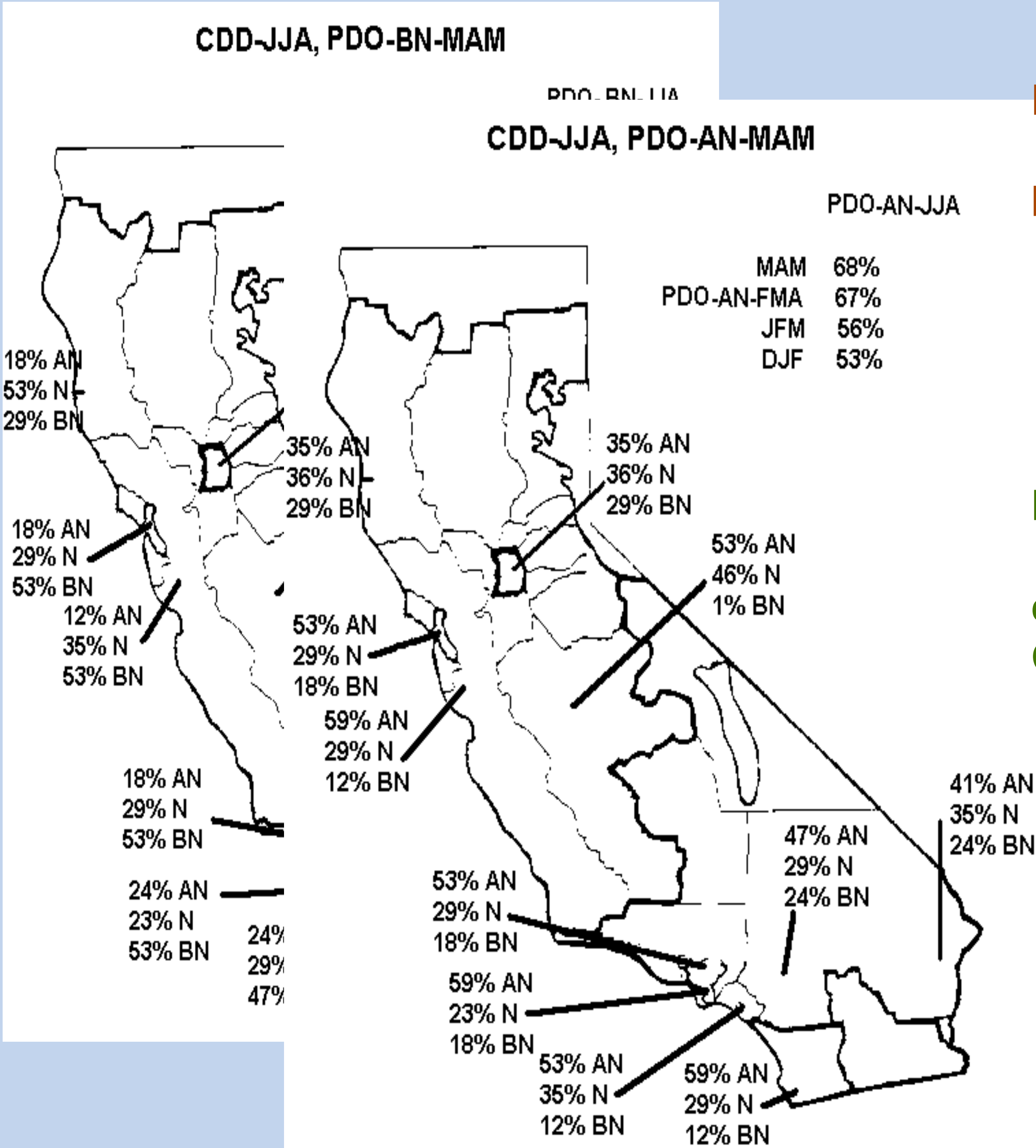
Calif summer Divisional temp 1945-2004





Pacific Decadal Oscillation

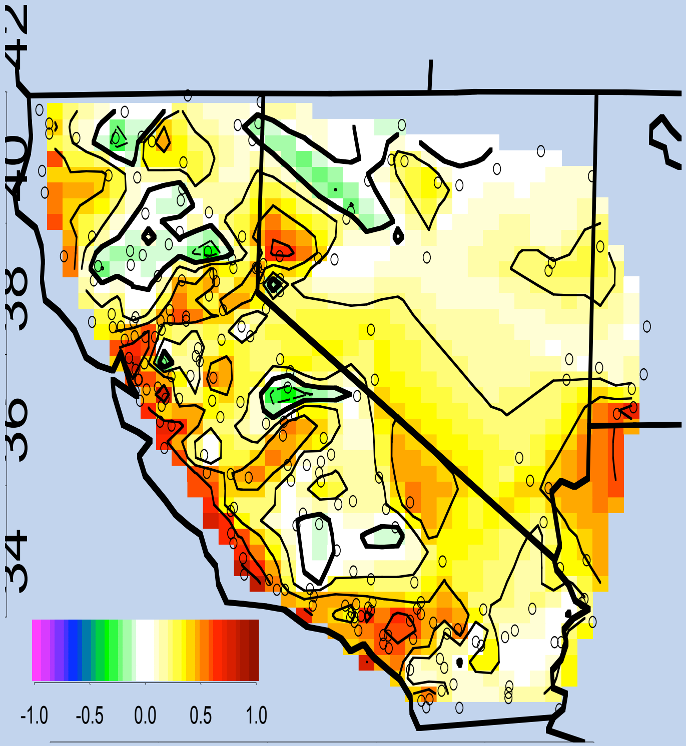
Nate Mantua
Univ Wash

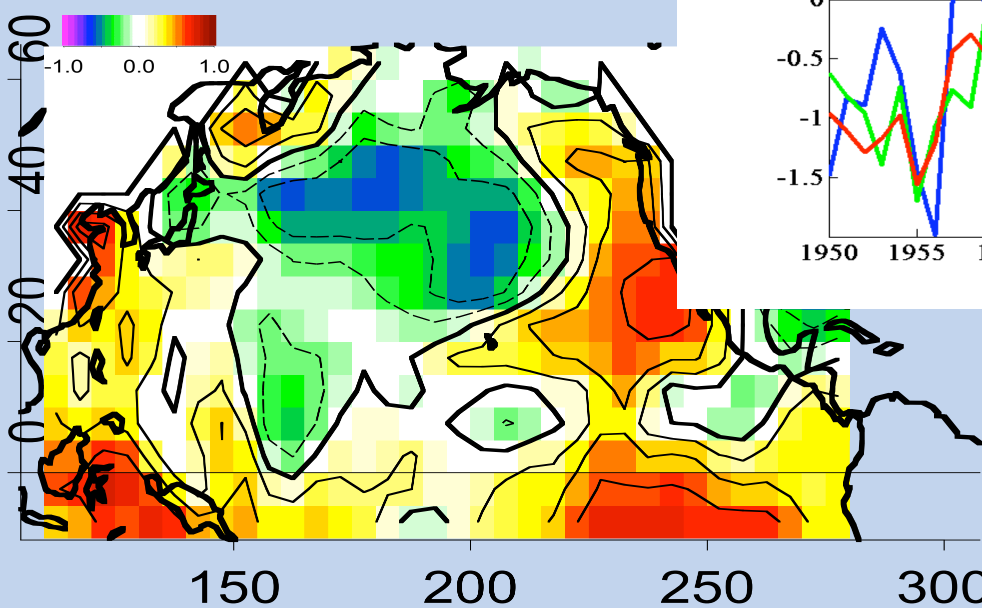


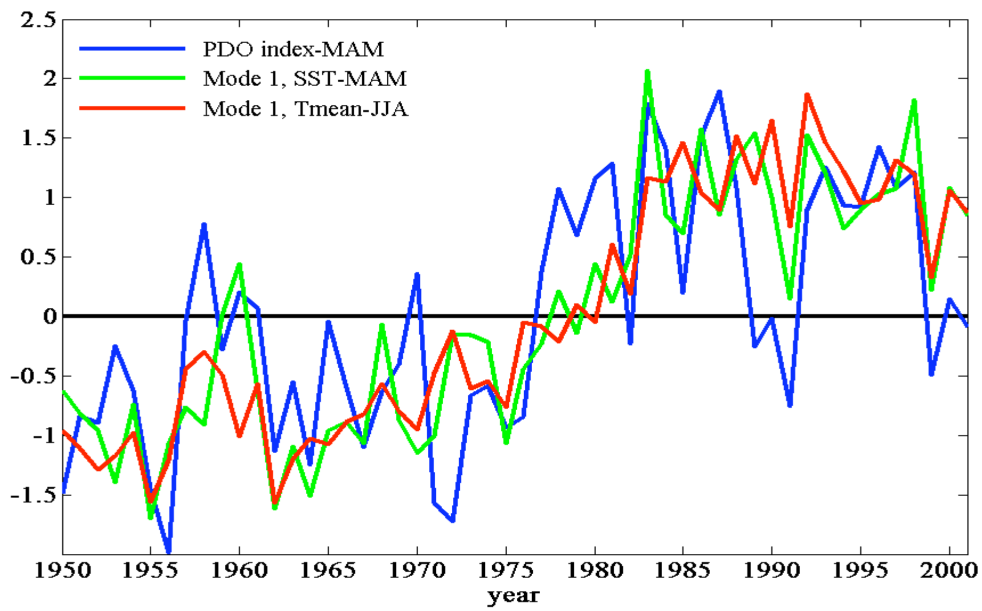
Simple index of spring PDO above/below normal increases odds of high/low cooling degree days and decreases odds (by about half) of low/high cooling degree days

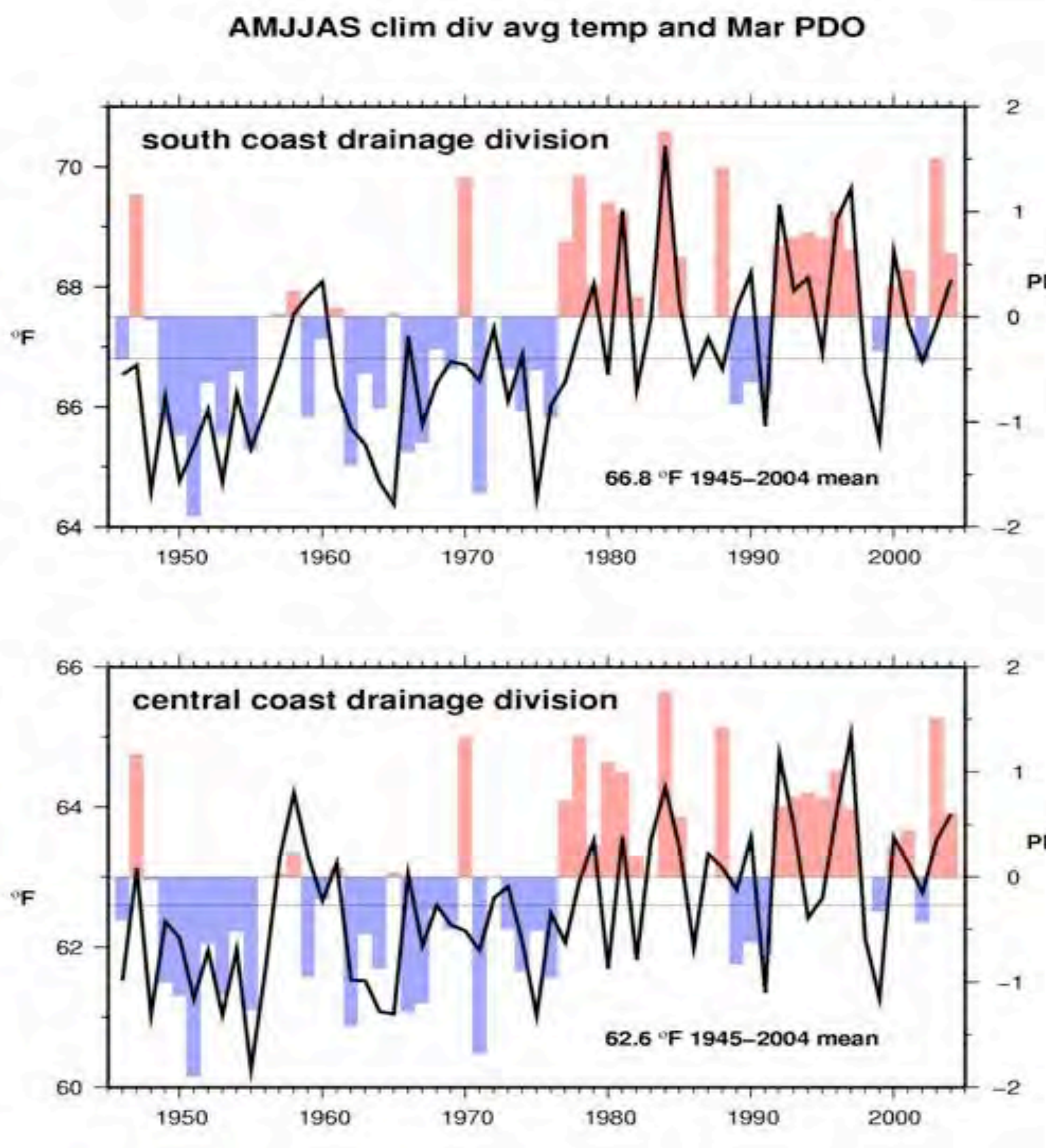
PDO		Below	Above
coastal	A	18	53
CDD	N	34	30
	B	48	17

Summer temperatures departures over much of California have been preceded by N Pac SST fluctuations that resemble “PDO”

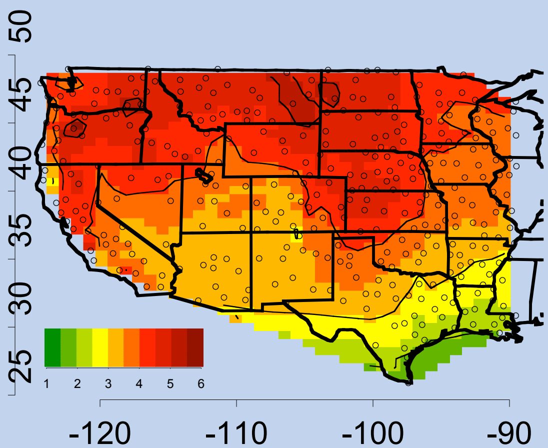




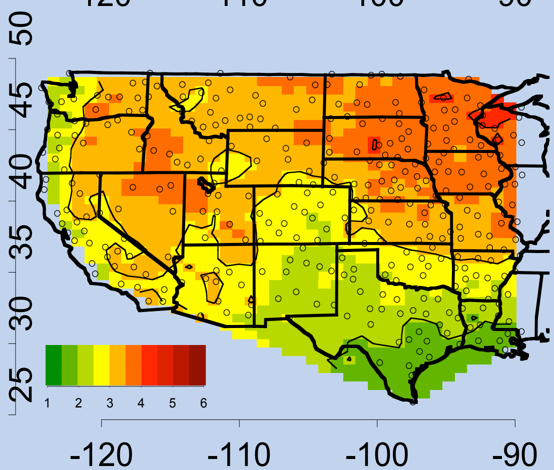




March PDO
and
April-Sept temp
so & cntrl Coast
Climate divisions

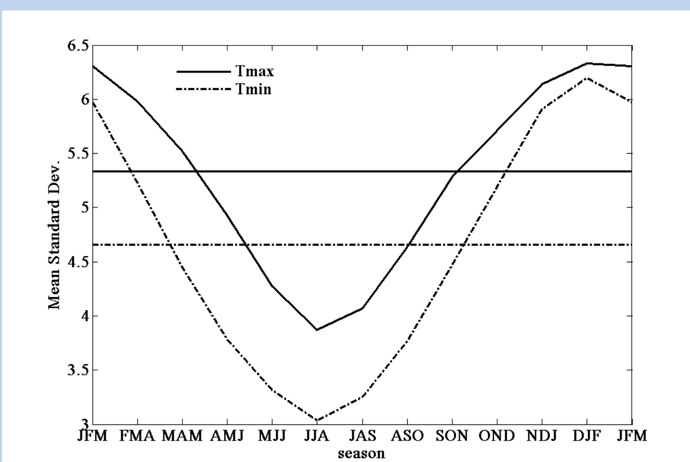


JJA-Tmax, avg. std. 3.87



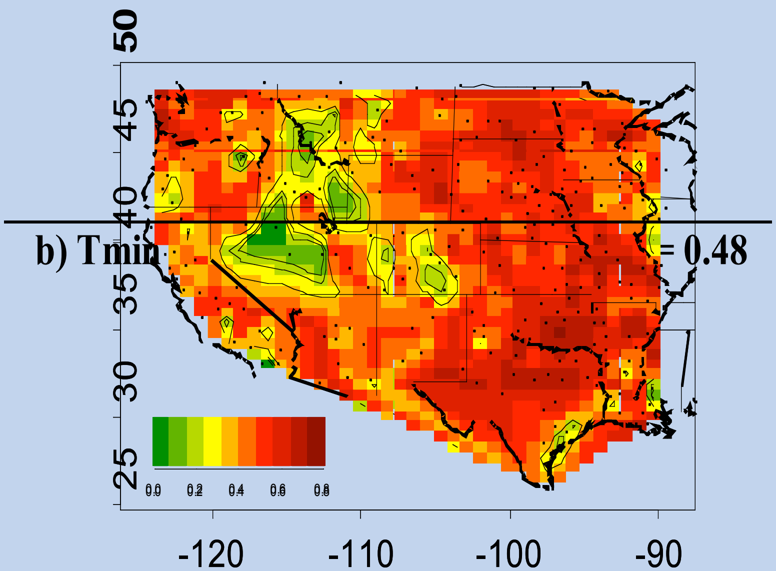
JJA-Tmin, avg. std. 3.04

summer daytime temperature (Tmax) exceeds that of nighttime temperature (Tmin)



West USA

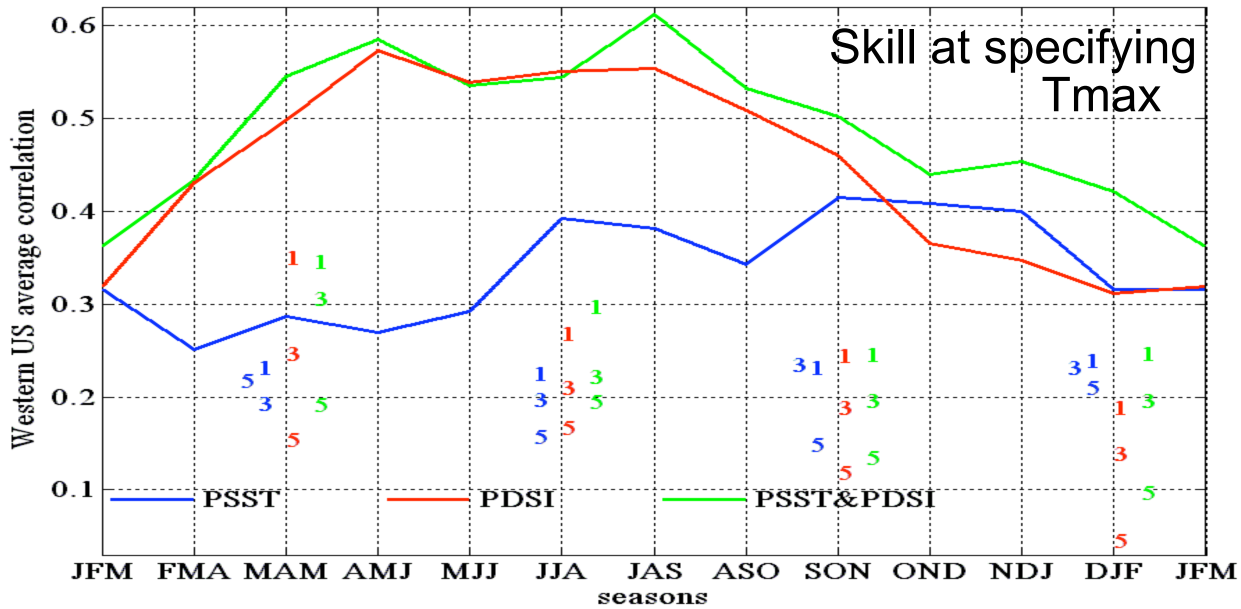
a) Tmax -JJA, PDSI-JJA, FAS = 0.54

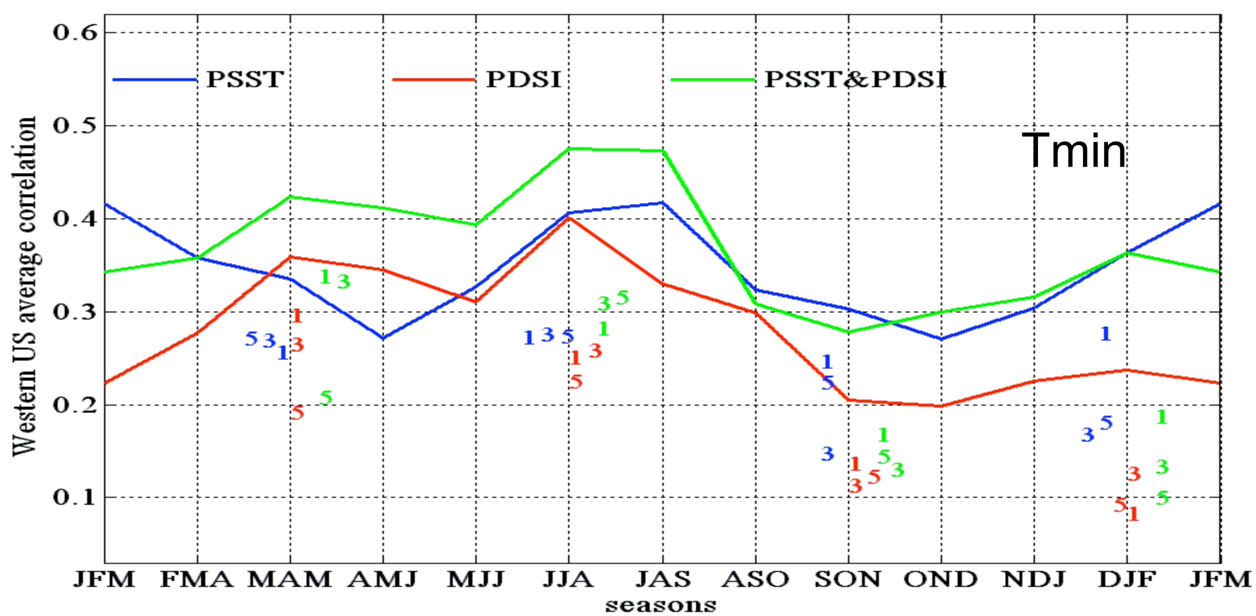


Specification skill
For Tmax (above) and
Tmin (below) for
summer (JJA)

Quite high using
PDSI alone for Tmax
PDSI and Pacific SST for Tmin

Surface boundary influences
Are significant in summer:



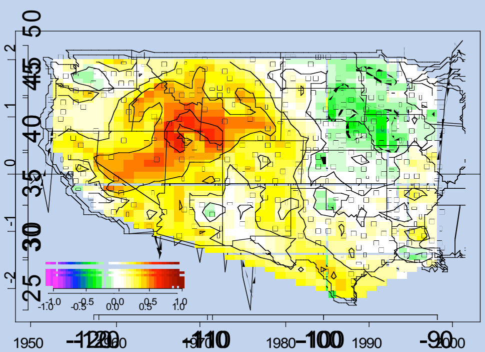


Processes affecting daytime temp (Tmax) differ greatly from those affecting nighttime temp (Tmin)

During summer in the western United States, Tmax is most directly Affected by soil moisture (PDSI), while Tmin is affected by both PDSI and Pacific SST

However, Pacific SST Tends to have more memory and Seasonal influence On Tmax and esp Tmin

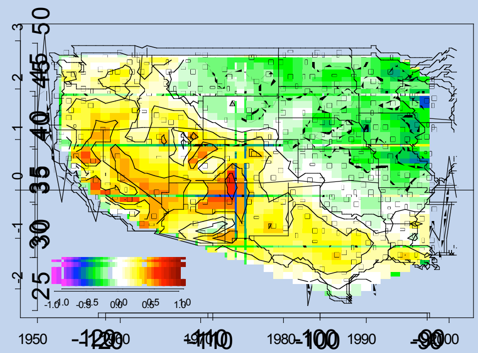
a)Tmax, PDSI, JJA, mode1
r = 0.89



d) PDSI, avg. var. = 0.07

g) Tmax, avg. var. = 0.07

c) mode3
r = 0.77



f) PDSI, avg. Var. = 0.07

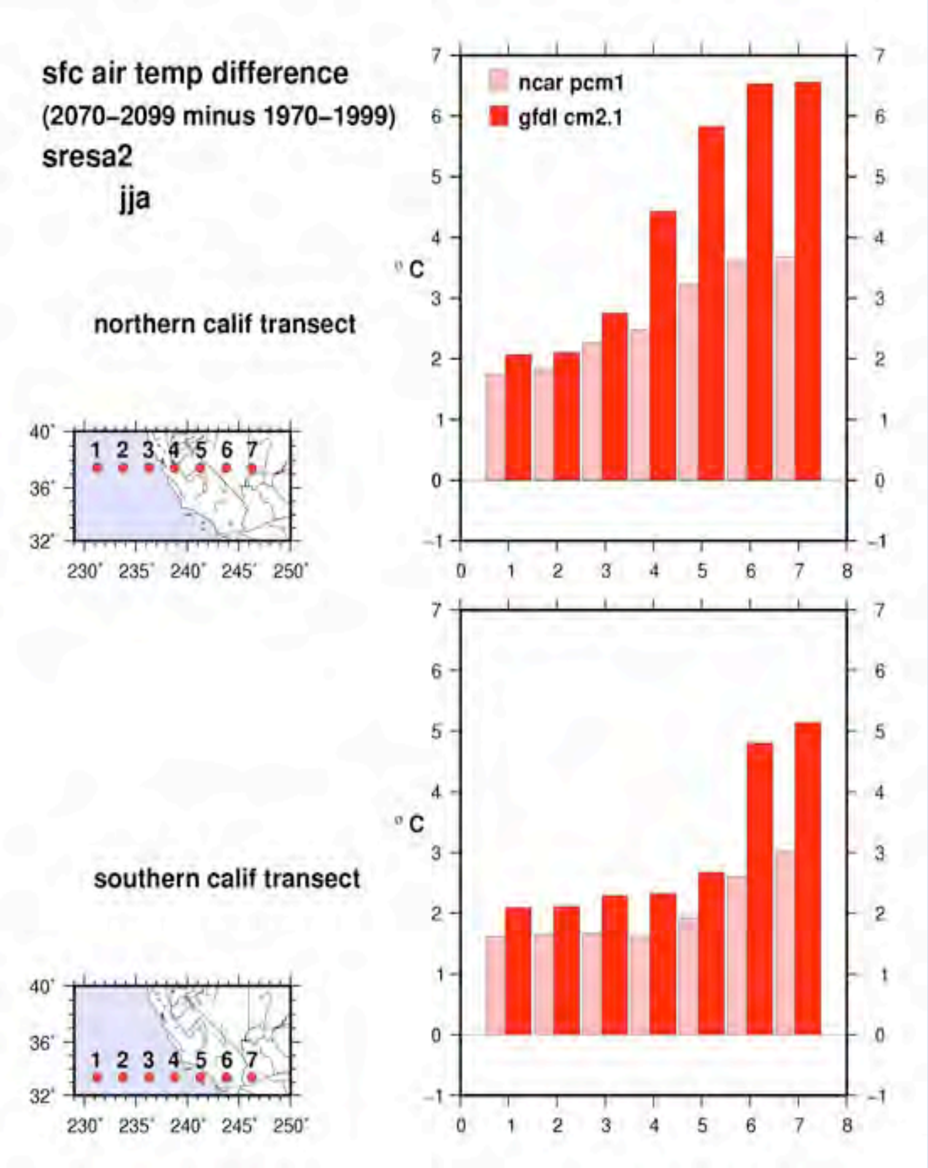
i) Tmax, avg. var. = 0.08

Correspondence Between summer PDSI and Tmax Anomalies, as Revealed by Canonical correlations

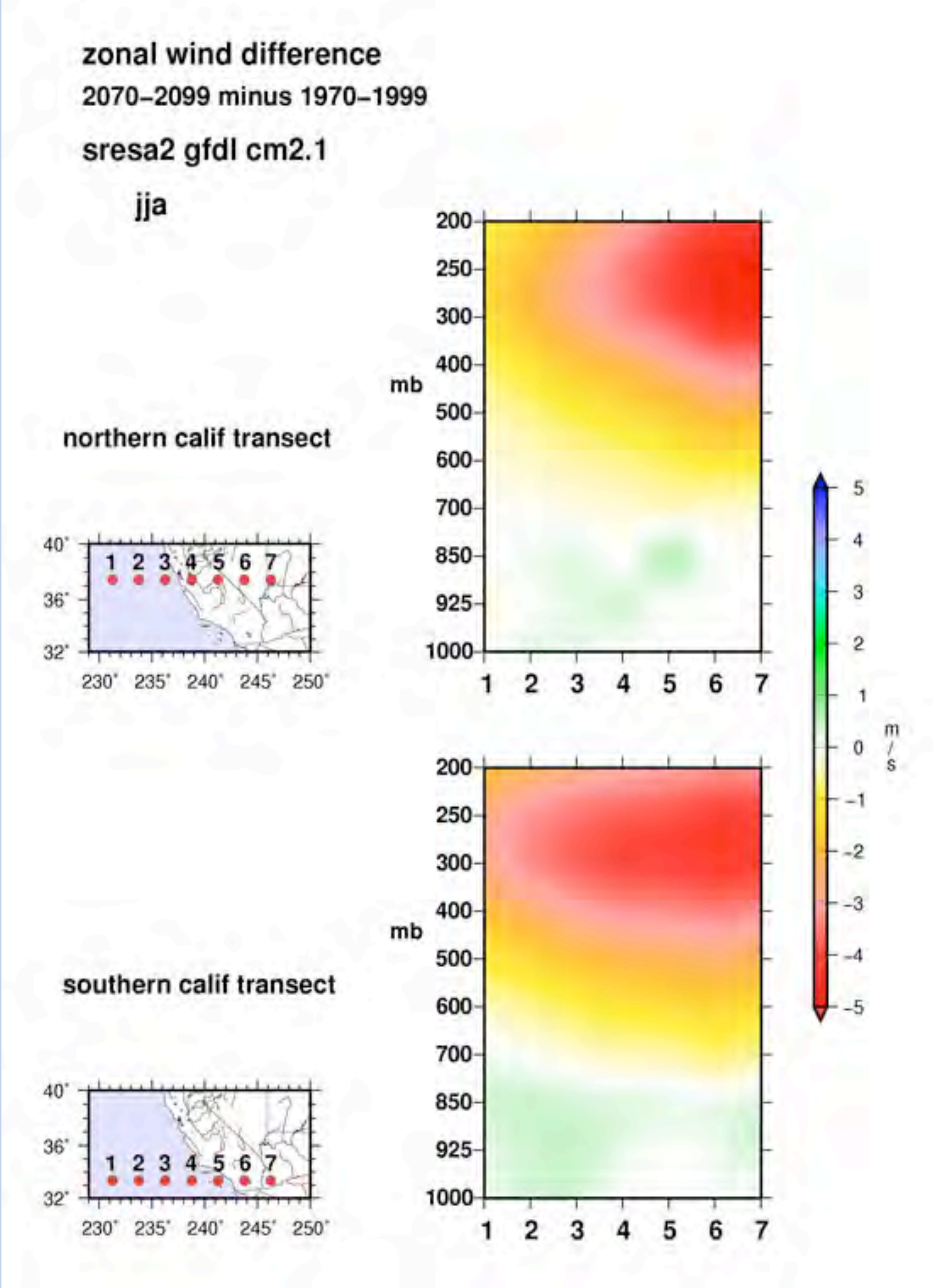
Climate warming in GCMs

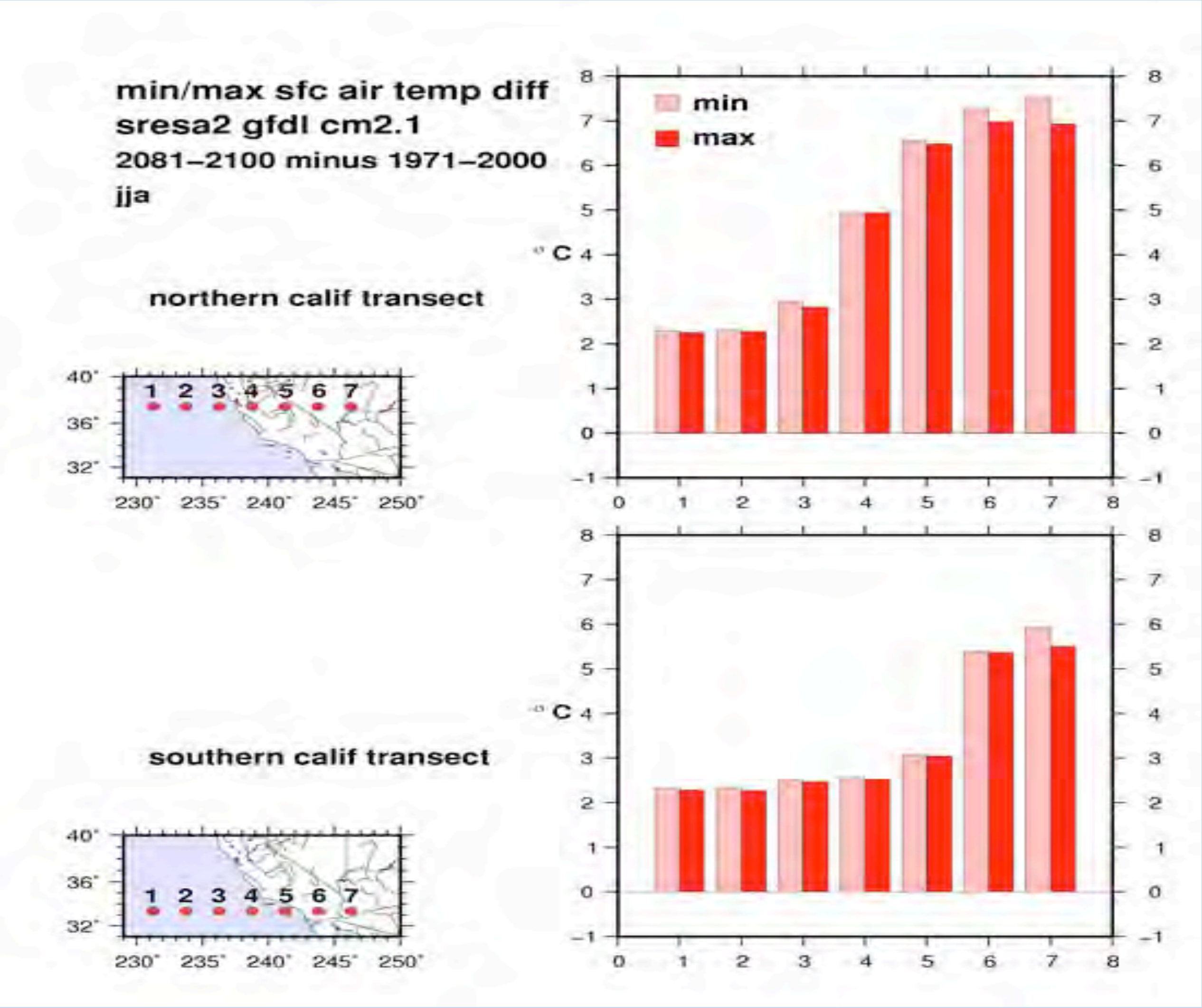
Larger on land than in ocean
This suggests that mechanisms
Involving land surface and
Ocean temperature
Influences may operate

Thus, we need regional models
with more resolved structure



Circulation Changes Are Projected





Daytime And Nighttime Temps Show Similar warming

Conclusions:

Summer temperature fluctuations in California are affected by Pacific SST patterns, especially the PDO

PDO offers predictive skill at a season in advance

Tmax is more affected by land surface conditions (PDSI) than is Tmin, which is affected by both PDSI and PSST

Global change GCM simulations suggest strong gradients in warming at coastal boundaries, for both daytime and nighttime temperatures. Land surface and ocean processes may amplify these differences. Subtle coastal circulation changes may occur.

Regional models needed to explore these phenomena